DEPARTMENT OF
SCIENTIFIC AND INDUSTRIAL RESEARCH

# Industrial Research and Development Expenditure
# 1958

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# FOREWORD

THIS report is the second of a series, the first having been published by D.S.I.R. in December, 1958, under the title "Estimates of Resources Devoted to Scientific and Engineering Research and Development in British Manufacturing Industry, 1955". Some improvements of method have been made and we hope that growing experience will enable us to make further improvements in future surveys. We are grateful to those who helped us with these enquiries and we hope that they and others will be interested to see the results which show that, even over a period as short as three years, remarkable changes have occurred in British industrial research and development.

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*Chairman*
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Council for Scientific and
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# Industrial Research and Development Expenditure, 1958

## I. GENERAL RESULTS

1. We estimate that British manufacturing industry spent about £300 million on research and development in 1958; 95 per cent of this was spent in industry's own establishments, and about 5 per cent on payments to outside bodies (including co-operative research associations, universities, and other public and private research institutions).

2. The previous estimates related to 1955[1], and were made in a somewhat different way. They showed an expenditure of about £190 million, 3·1 per cent of manufacturing industry's contribution to national production. The corresponding proportion for 1958 was 4·2 per cent[2]. It would appear from these figures that research and development effort has more than kept pace with the change in the value of production, and we do not consider that this conclusion can be explained away by imperfections in the statistics. Research and development effort was expanding over a period in which the volume of production changed very little.

3. In 1955 it was estimated that nearly two-thirds of expenditure on research and development in manufacturing industry's own establishments was provided out of defence contracts. In 1958 the proportion was less than half, so that expenditure on 'civil' research and development has approximately doubled between 1955 and 1958.

## II. METHODS

4. Since the publication of the 1955 estimates we have explored various methods for improving the statistical basis of the estimates. The basic method in 1955 was to apply to estimates of research and development man-power, obtained from the first survey of scientific and engineering man-power[3], a single estimate (£1300) of cost per person employed on research and development, obtained from a sample survey. The basic method in 1958 was to apply to the estimate of *fully qualified* man-power engaged in research and development[4], estimates of cost per *fully qualified* person obtained, industry by industry, from a sample survey.

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[1] *Estimates of Resources devoted to Scientific and Engineering Research and Development in British Manufacturing Industry*, 1955, (H.M.S.O. December, 1958).

[2] Based on the net value of output shewn in 'National Income and Expenditure 1959': this differs from the estimates of net output used in Table III which are taken from the Census of Production and include the value of certain services used and gross margins on merchanting activities.

[3] *Scientific and Engineering Man-power in Great Britain* (H.M.S.O. 1956).

[4] *Scientific and Engineering Man-power in Great Britain*, 1959 (Cmnd. 902, H.M.S.O. 1959). This survey did not provide estimates of research and development man-power not classified as 'fully qualified'. The definition of 'fully qualified' scientists and engineers used for this survey and also by D.S.I.R. is reproduced in the Appendix to this report.

5. In April, 1959, the Department of Scientific and Industrial Research (D.S.I.R.) sent out a questionnaire on expenditure on research and development in 1958 to 502 companies known or believed to engage in these activities. The questionnaire is reproduced in the Appendix to this report. A total of 292 usable returns were received. The data provided by these returns were used to construct estimates of the total cost of employing one fully qualified worker on research and development in each of the industries or groups of industries for which the Ministry of Labour has made separate estimates of the number of qualified workers employed. Data on the iron and steel industry were supplied by the Iron and Steel Board as the result of an enquiry carried out by the British Iron and Steel Federation. This enquiry, covering all the companies in the Federation, was carried out at approximately the same time as the D.S.I.R. enquiry and was designed to provide approximately the same information. Estimates of the research and development in the aircraft industry were supplied by the Ministry of Aviation.

6. The Ministry of Labour's man-power enquiry was addressed to all manufacturing establishments employing 500 persons or more, and to a sample of those employing between eleven and 499 persons. The overall response rate was about 80 per cent, but, since research and development is mostly concentrated in a small number of establishments, the estimates of research and development man-power must be presumed to be sensitive to small changes of coverage involving these establishments. There are some industries in which failure to obtain a response from a single major research establishment could make a considerable difference to the final estimate of research man-power; and errors could also be caused if the response of an industry was strongly biased towards those establishments which do conduct research.

7. The D.S.I.R. enquiry showed a response rate of 58 per cent. This is somewhat better than it appears: the replies from the 292 companies covered 1044 establishments (including nine central research establishments serving an unspecified number of factories) and the D.S.I.R. and British Iron and Steel Federation returns together accounted for over half the fully qualified scientists and engineers estimated to be employed on research and development in all manufacturing industry other than the aircraft industry. Coverage was almost complete for the ceramics, glass and cement group of industries, for mineral oil refining, metal manufacture, and the man-made fibre industry; it was high for chemicals and allied trades and for the cotton industry and for the electronics section of the electrical engineering industry. It was generally low in the engineering trades, but most of the figures of 'cost per qualified worker' obtained from the returns for these trades appear reasonable and consistent.

8. It is unfortunately possible that errors in the man-power estimates (e.g. those caused by non-response) are correlated with errors in the estimates of cost per qualified worker, and the combination of errors could produce an exaggerated effect on the estimate of research expenditure for a particular industry. Nevertheless, we consider that the 1958 estimates are more reliable than those for 1955, and we hope to obtain greater reliability in future surveys.

TABLE I. *Cost per qualified worker and employment on research and development by industry groups*

| Standard Industrial Classification[1] | | | Cost per qualified worker in research and development | Qualified workers in research and development | Employment on research and development in industries own establishments | | | |
|---|---|---|---|---|---|---|---|---|
| Order | Minimum List Heading | | | | Total | Qualified Scientists and Engineers | Holders of only H.N.C. H.N.D. or equivalent | Others |
| | | | £ | *number* | *number* | *per cent* | *per cent* | *per cent* |
| | | **All manufacturing industries** | **10 791** | **26 225** | **113 508** | **23** | **12** | **65** |
| | | **All manufacturing industries except aircraft** | 7 968 | **22 977** | **95 644** | **24** | **12** | 64 |
| III | 20–29 | Ceramics, glass, cement, etc. | 8 727 | 343 | 1 091 | 31 | 9 | 60 |
| IV | 30–39 | Chemicals and allied trades | 6 655 | 6 368 | 20 476 | 31 | 9 | 60 |
| | | of which: | | | | | | |
| | 36 | mineral oil refining | 9 844 | 677 | 2 322 | 29 | 7 | 64 |
| V | 40–49 | Metal manufacture | 6 923 | 975 | 3 220 | 30 | 13 | 57 |
| | | of which: | | | | | | |
| | 40–44 | iron and steel | 6 103 | 640 | 1 883 | 34 | 15 | 51 |
| | 49 | non-ferrous metals | 8 489 | 335 | 1 337 | 25 | 9 | 66 |
| VI (Part) and VIII | 50–69 and 90–99 | Non-electrical engineering and shipbuilding[2] | 8 472 | 3 307 | 15 612 | 21 | 14 | 65 |
| VI (Part) | 70–79 | Electrical engineering and electrical goods[3] | 7 472 | 7 677 | 31 848 | 24 | 13 | 63 |
| | | of which: | | | | | | |
| VI (Part) | 72–74 | electronics | 7 908 | 2 996 | 10 175 | 29 | 11 | 60 |
| VII (Part) | 82 | Aircraft | 30 763 | 3 248 | 17 864 | 18 | 14 | 68 |
| VII (Part) | 80–81 and 83–89 | Motor and other vehicles and accessories | 19 778 | 806 | 9 016 | 9 | 13 | 78 |
| IX | 100–103 | Precision instruments, etc. | 13 535 | 853 | 4 137 | 20 | 16 | 64 |
| X, XI and XII | 110–149 | Textiles, leather, leather goods and clothing | 8 191 | 939 | 3 835 | 24 | 8 | 68 |
| | | of which: | | | | | | |
| | 110–111 | cotton | 4 804 | 48 | 186 | 26 | 13 | 61 |
| | 113–114 | man-made fibres | 10 943 | 575 | 2 588 | 22 | 8 | 70 |
| XIII | 150–169 | Food, drink and tobacco | 6 642 | 705 | 3 144 | 22 | 14 | 64 |
| XIV and XV | 170–189 | Manufactures of wood and paper, and printing | 7 244 | 241 | 762 | 32 | 15 | 53 |
| XVI | 190–199 | Other manufacturing | 5 313 | 763 | 2 503 | 30 | 5 | 65 |

*Notes:*
[1] Standard Industrial Classification, H.M.S.O. 1948.
[2] Includes metal goods not elsewhere specified.
[3] Includes some mechanical engineering associated with electrical engineering where research and production in both fields are carried out in the same establishments.

## III. COST PER QUALIFIED WORKER

9. The estimates of cost per qualified worker were the primary purpose of the D.S.I.R. survey, and are therefore presented first. They vary greatly from one industry to another, being related to the weight of development expenditure and to the amount of use made of supporting (not 'fully qualified') staff. The average for all manufacturing industry was nearly £11 000, but since the figure for the aircraft industry was nearly £31 000, the average for manufacturing industry other than aircraft was just under £8 000. This may be compared with an estimated cost per qualified worker of £5 600 in 1955; an increase of 14 to 15 per cent can be attributed to rising prices and incomes, but, even at constant prices, there appears to have been an increase in expenditure per qualified worker at constant prices of the order of 27 per cent. This increase

TABLE II. *Estimated expenditure on research and development*, 1958
*Distribution by main industries*

| | Total | | Expenditure in industries own establishments | | Payments outside bodies | |
|---|---|---|---|---|---|---|
| | £ million | Per cent | £ million | Per cent | £ million | Per cent |
| **All manufacturing industries** | **296·7** | **100·0** | **283·0** | **100·0** | **13·7** | **100·0** |
| **All manufacturing industries except aircraft** | **196·7** | **66·3** | **183·1** | **64·7** | **13·6** | **99·5** |
| Ceramics, glass, cement, etc. | 3·2 | 1·1 | 3·0 | 1·1 | 0·2 | 1·5 |
| Chemicals and allied trades[1] | 43·0 | 14·5 | 42·4 | 15·0 | 0·6 | 4·4 |
| of which: | | | | | | |
| mineral oil refining | 6·8 | 2·3 | 6·7 | 2·4 | 0·1 | 1·1 |
| Metal manufacture | 8·1 | 2·7 | 6·8 | 2·4 | 1·3 | 9·5 |
| of which: | 5·1 | 1·7 | 3·9 | 1·4 | 1·2 | 8·8 |
| iron and steel | | | | | | |
| non-ferrous metals | 3·0 | 1·0 | 2·8 | 1·0 | 0·15 | 1·1 |
| Non-electrical engineering and shipbuilding[2] | 29·4 | 9·9 | 28·0 | 9·9 | 1·4 | 10·2 |
| Electrical engineering and electrical goods[3] | 64·5 | 21·7 | 57·4 | 20·3 | 7·1 | 52·0 |
| of which: | | | | | | |
| electronics | 24·6 | 8·3 | 23·7 | 8·4 | 0·9 | 6·6 |
| Aircraft | 100·0 | 33·7 | 99·9 | 35·3 | 0·1 | 0·7 |
| Motor and other vehicles and accessories | 17·1 | 5·8 | 15·9 | 5·6 | 1·2 | 8·8 |
| Precision instruments, etc. | 11·6 | 3·9 | 11·5 | 4·1 | 0·1 | 0·7 |
| Textiles, leather, leather goods and clothing | 8·6 | 2·9 | 7·6 | 2·7 | 1·0 | 7·3 |
| of which: | | | | | | |
| cotton | 0·5 | 0·2 | 0·2 | 0·1 | 0·25 | 1·8 |
| man-made fibres | 6·6 | 2·2 | 6·3 | 2·2 | 0·35 | 2·6 |
| Food, drink, and tobacco[1] | 5·0 | 1·7 | 4·7 | 1·7 | 0·3 | 2·2 |
| Manufactures of wood and paper, and printing | 2·0 | 0·7 | 1·8 | 0·6 | 0·2 | 1·5 |
| Other manufacturing | 4·1 | 1·4 | 4·0 | 1·4 | 0·1 | 0·7 |

*Notes:* [1] Some research on food products is unavoidably included in "Chemicals and allied trades". The error is probably of the order of £500,000 which if allocated to "Food, drink and tobacco" would increase the total for that industry by 10 per cent.

[2] See Note [2] to Table I.

[3] See Note [3] to Table I.

can partly be explained by under-estimation for 1955, but there has no doubt been a real increase. Some of it may be attributed to the use of more elaborate equipment, but an important factor is the increase in the number of supporting staff per qualified worker, from about two in 1955 to three in 1958.

10. Table I presents the estimates of cost per qualified worker for industry groups for which we consider that separate estimates can reasonably be given, the numbers of qualified workers (as shown by the Ministry of Labour enquiry), and also estimates (derived from the D.S.I.R. enquiry) of *total* employment on research and development, with the proportions holding different types of qualification.

## IV. TOTAL RESEARCH AND DEVELOPMENT EXPENDITURE

11. Table II is derived by applying the estimates of cost per qualified worker to the estimates of numbers of qualified workers; it also shows the figures obtained for payments to outside bodies.

12. In 1958 (as in 1955), the main concentrations of research and development effort were in the chemical, electrical engineering and aircraft industries. About 80 per cent of the defence contracts for research and development were let to the two latter industries.

## V. RESEARCH AND DEVELOPMENT EXPENDITURE IN RELATION TO OUTPUT

13. As shown in Table II, there is a remarkable variation in the amounts of money devoted by different groups of industries to research and development. These differing expenditures are more significant when they can be compared with some measure of production in the industries concerned. The gross value of production or turnover is a misleading measure when dealing with *groups* of industries taken together because within a group the sales of one industry often provide the raw material of another, so that the combined total turnover will include some double counting. We have therefore compared our estimates of research and development expenditure with the Board of Trade's estimates of *net output*, or value added by manufacture, derived from the 1958 Census of Production.[1] The results of this comparison are shown in Table III. (see p. 6).

As is to be expected, the science-based industries spend a far higher proportion of their resources on research and development than do the traditional industries. The aircraft industry spends an amount equal to over a third of its net output. Next in order come electrical engineering, precision instruments and the chemical industries.

In addition the bulk of the defence contracts (see paragraph 3) are with these industries. The defence contracts not only make a very substantial addition to research and development expenditure, but it is possible that the methods of accounting employed for these contracts tend to cost to development expenditure which in other industries might be costed to production.

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[1] Board of Trade Journal, 15th January, 1960

TABLE III. *Research and development expenditure compared with net output*[1]

| | Net output[1] | Research and development expenditure | |
|---|---|---|---|
| | £ mn. | £ mn. | Per cent of net output |
| **All manufacturing industries** | 7772·0 | 296·7 | 3·8 |
| **All manufacturing industries except aircraft** | 7492·1 | 196·7 | 2·6 |
| Ceramics, glass, cement, etc. | 294·9 | 3·2 | 1·1 |
| Chemicals and allied trades | 734·9 | 43·0 | 5·9 |
| Metal manufacture | 703·6 | 8·1 | 1·15 |
| of which: iron and steel | 561·1 | 5·1 | 0·9 |
| non-ferrous metals | 142·4 | 3·0 | 2·1 |
| Non-electrical engineering and shipbuilding[2] | 2251·6 | 29·4 | 1·8[4] |
| Electrical engineering and electrical goods[3] | | 64·5 | 9·8[4] |
| of which: electronics | 206·2 | 24·6 | 11·9 |
| Aircraft | 279·9 | 100·0 | 35·7 |
| Motor and other vehicles and accessories | 519·6 | 17·1 | 3·3 |
| Precision instruments, etc. | 108·6 | 11·6 | 10·7 |
| Textiles, leather, leather goods and clothing[5] | 935·2 | 8·6 | 0·9 |
| Food, drink and tobacco | 940·0 | 5·0 | 0·6 |
| Manufactures of wood and paper, and printing | 777·8 | 2·0 | 0·25 |
| Other manufacturing | 225·9 | 4·1 | 1·8 |

*Notes:* [1] Net output represents the value added to materials by the process of production, including the gross margin of any merchanted or factored goods sold. See footnote [2] on page 1. The figures in this table are not comparable with those in Table 6 in 'Estimates of Resources Devoted to Scientific and Engineering Research and Development in British Manufacturing Industry, 1955' which related only to establishments with 100 or more employees

[2] See Note [2] to Table I

[3] See Note [3] to Table I

[4] Estimate

[5] Research and development expenditure for man-made fibres amounted to 14·0 per cent of the net output of these fibres, ignoring spinning and weaving.

## VI. SOME DETAILS OF RESEARCH AND DEVELOPMENT EXPENDITURE

14. The data provided by the returns from the D.S.I.R. enquiry permitted a fairly detailed analysis of expenditure under various main heads of account. The results are set out in Table IV. Capital expenditure accounted for just over 10 per cent of manufacturing industries total expenditure on research and development in its own establishments. Capital expenditure by the chemical and engineering industries accounted for over half the total for all manufacturing industry.

## VII. ORGANIZATION OF RESEARCH AND DEVELOPMENT

15. The estimates of employment of qualified scientists and engineers were based on a survey of manufacturing establishments. The information on expenditure collected by D.S.I.R. was supplied by companies. Owing to the

TABLE IV. *Analysis of expenditure on research and development*

| | Current Expenditure | | | | | | |
|---|---|---|---|---|---|---|---|
| | Total £'000 | Salaries and wages | Materials and equipment | Administration | Repairs and depreciation | All other items | Capital expenditure £'000 |
| | | Per cent of total | | | | | |
| **All manufacturing industries** | 253 765 | 44 | 22 | 10 | 12 | 12 | 29 242 |
| **All manufacturing industries except aircraft** | 157 045 | 50 | 18 | 8 | 12 | 11 | 26 044 |
| Ceramics, glass, cement, etc. | 2 447 | 32 | 17 | 6 | 39 | 6 | 546 |
| Chemicals and allied trades[1] | 35 402 | 52 | 14 | 9 | 14 | 10 | 6 979 |
| Metal manufacture | 5 711 | 49 | 16 | 8 | 11 | 16 | 1 039 |
| Non-electrical engineering and shipbuilding[2] | 24 228 | 52 | 14 | 6 | 16 | 13 | 3 791 |
| Electrical engineering and electrical goods[3] | 48 488 | 47 | 22 | 11 | 7 | 13 | 8 876 |
| Aircraft | 96 720 | 32 | 29 | [4] | [4] | [4] | 3 198 |
| Motor and other vehicles and accessories | 14 432 | 54 | 22 | 5 | 6 | 13 | 1 509 |
| Precision instruments, etc. | 11 209 | 54 | 27 | 4 | 7 | 8 | 336 |
| Textiles, leather, leather goods and clothing | 6 424 | 49 | 18 | 4 | 17 | 12 | 1 190 |
| Food, drink and tobacco | 3 459 | 56 | 10 | 8 | 16 | 10 | 1 223 |
| Manufactures of wood and paper, and printing | 1 481 | 45 | 7 | 28 | 13 | 7 | 265 |
| Other manufacturing | 3 764 | 55 | 17 | 6 | 14 | 8 | 290 |

*Notes:* [1] See Note [1] to Table II

[2] See Note [2] to Table I

[3] See Note [3] to Table I

[4] Insufficient data to support estimate

different bases of the two enquiries it is not possible to estimate the value of research carried out for the bigger industrial groups in supporting establishments; the coverage of the D.S.I.R. enquiry was not good enough to provide a basis for estimating the research and development effort of manufacturing companies of different sizes. The man-power survey, however, indicated that in 1958, as in 1955, the majority of qualified scientists and engineers engaged on research and development were concentrated in the larger establishments, employing 500 or more persons in total.

16. As shown in Table II, about 5 per cent of manufacturing industry's total expenditure on research and development was made up of payments to outside bodies. The estimates of the amounts of these payments were derived from the replies to the D.S.I.R. expenditure questionnaire (see Appendix) and from accounts of research associations. Recipients of the questionnaire were asked to show payments under four heads, payments to Government departments and Government laboratories, payments to co-operative research associations

TABLE V. *Estimated payments by manufacturing industries to outside bodies for research in 1958*

| | Total £'000 | To Government departments and research laboratories | To co-operative research associations | To universities and technical colleges[3] | To other research institutions |
|---|---|---|---|---|---|
| | | Per cent of total | | | |
| **All manufacturing industries** | 13 664 | 2 | 29 | 4 | 65 |
| **All manufacturing industries except aircraft** | 13 582 | 2 | 29 | 4 | 65 |
| Ceramics, glass, cement, etc. | 227 | 3 | 86 | 2 | 9 |
| Chemicals and allied trades | 666 | 6 | 37 | 29 | 27 |
| Metal manufacture | 1 336 | — | 72 | 4 | 24 |
| Non-electrical engineering and shipbuilding[1] | 1 412 | 16 | 58 | 6 | 21 |
| Electrical engineering and electrical goods[2] | 7 101 | — | 3 | 1 | 96 |
| Aircraft | 82 | — | 23 | 18 | 59 |
| Motor and other vehicles and accessories | 1 158 | — | 8 | — | 91 |
| Precision instruments, etc. | 57 | 3 | 72 | 4 | 21 |
| Textiles, leather, leather goods and clothing | 995 | 1 | 85 | 4 | 10 |
| Food, drink and tobacco | 329 | — | 43 | 2 | 55 |
| Manufactures of wood and paper, and printing | 217 | 1 | 98 | — | 1 |
| Other manufacturing | 84 | — | 72 | 7 | 21 |

*Notes:* [1] See Note [1] to Table I

[2] See Note [8] to Table I

[3] This column does not include industrial contributions to research in universities and colleges in the form of fellowships or gifts of money or instruments to scientific departments for general research purposes. See footnote on page 9.

in the government scheme, payments to universities and technical colleges[1] and finally, payments to other research institutions. In the absence of any other suitable factors for grossing up the results of the sample, the same factors were used for expenditure in firms' own establishments. The analysis of the results is shown in Table V.

Payments to co-operative research associations in the government scheme amounted to 29 per cent of the estimated total of £13·7 million or nearly £4 million. Two thirds of the total payments to outside bodies were to "other research institutions". These included payments to independent research institutions and to industrial consultants but the principal items appear to have been payments by firms in the newer industries (particularly the electrical and motor vehicle industries) for technical "know-how" from other companies. Often these payments were to parent or associated companies overseas. The D.S.I.R. questionnaire did not specifically ask for royalties and similar payments to be included and it is probable that the returns were not consistent on this point.

17. The proportion of research expenditure paid to outside bodies was highest in the industries comprising a large number of small manufacturers. These tended to concentrate their research effort in the co-operative research associations. Thus in the textile (other than man-made fibres), leather and clothing industries nearly half the total research and development expenditure was in payments to research associations.

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[1] Recipients were asked to include payments made to universities and colleges for research carried out on problems connected with their production activities. They were asked to exclude payments of a "charitable" nature. The estimates of total payments made to universities and colleges for industrial research do not therefore include the very considerable sums given by industry in the form of fellowships, direct grants in aid to scientific departments, instruments, etc.

# APPENDIX

## DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH

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## INDUSTRIAL RESEARCH AND DEVELOPMENT EXPENDITURE ENQUIRY 1958

### I. *Details of business*

1. Name and address of company ..................................
..................................
..................................
2. Principal trade or business (see Note 1) ..................................
3. Number of manufacturing establishments covered by this return ..................................
4. Year of return (see Note 2). Twelve months ended ......................195
5. Total number of persons employed by the company in the pay-week ended on or about 25th October 1958 (see Note 3) ..................................

### II. *Employment on research and development*

6. AVERAGE NUMBER OF PERSONS EMPLOYED ON RESEARCH AND DEVELOPMENT ACTIVITIES IN 1958 OR YEAR OF RETURN (see Notes 4 and 5)
   - (a) Number of qualified Scientists and Engineers ..............
   - (b) Number of holders of H.N.C., H.N.D. or equivalent qualification ..............
   - (c) Number of other workers ..............

## III. *Expenditure on research and development*

**7.** TOTAL EXPENDITURE ON RESEARCH AND DEVELOPMENT ACTIVITIES IN 1958 (see Notes 2 and 6) £ .................

**8.** ITEMS OF RESEARCH AND DEVELOPMENT EXPENDITURE CHARGED TO CURRENT ACCOUNT IN 1958

(a) Salaries and wages of persons directly employed on research and development (see Note 4) £ .................

(b) Materials and equipment (including books and journals) £ .................

(c) Fuel (coal, coke, oil, gas, electricity) and water £ .................

(d) Rent, rates and insurance (see Note 7) £ .................

(e) Maintenance and repairs to buildings and equipment £ .................

(f) Office and administration expenses (including salaries and wages of office workers) £ .................

(g) Depreciation of fixed assets (see Note 8) £ .................

(h) Other expenses £ .................

**9.** ITEMS OF EXPENDITURE ON RESEARCH AND DEVELOPMENT CHARGED TO CAPITAL ACCOUNT IN 1958

(a) Land and buildings (see Note 9) £ .................

(b) Research plant and equipment including pilot plant and prototypes and vehicles and boats if used specifically for research and development purposes £ .................

## IV. *Expenditure on research and development work done by other bodies*

**10.** TOTAL PAYMENTS IN 1958 FOR RESEARCH AND DEVELOPMENT WORK DONE BY OUTSIDE BODIES £ .................

(a) Payments to Government Departments and research laboratories £ .................

(b) Payments to co-operative industrial Research Associations in the Government Scheme (including annual membership fee, if paid direct) £ .................

(c) Payments to Universities and Technical Colleges £ .................

(d) Payments to other research institutions (see Note 10) £ .................

## NOTES

1. Please list the principal production activities carried out or controlled by the Company whose name appears in the first space on the form, including any subsidiary or ancillary undertakings even if they are carried on under different names. Where however a holding company or group includes units engaged on diverse production activities for which separate sets of accounts are kept, separate forms may be completed for each unit. Additional forms will be supplied by D.S.I.R. on request. Please exclude from the return non-production activities such as merchanting or factoring for which separate accounts are kept.

2. Your return should be made for the year ended 31st December 1958, but if this is inconvenient to you because your business year ends on some other date, please complete the return for your business year ending on any date between 6th April 1958 and 5th April, 1959. Figures for all sections of the return should be given for the same period of twelve months.

3. Please include all persons on the pay-roll (that is, whose National Insurance cards are held by you), whether full-time or part-time, employed in connection with the business covered by the return, including office employees, and any canteen workers or persons engaged in merchanting or factoring in departments for which separate accounts are not kept. (see Note 1).

4. *Research and development* activities should include the following kinds of work:
   - (a) Basic and fundamental scientific research.
   - (b) Applied research, technical development including technical design work, done so as to:—
     - (i) Use different raw materials, or
     - (ii) Introduce new working methods, processes, machinery or products, or
     - (iii) Improve existing working methods, processes, machinery or products.
   - (c) The construction of pilot plant or prototypes.
   - (d) All work done on research and development contracts issued by Government Departments, the Atomic Energy Authority and similar public bodies.

   Market research should be excluded.

5. *Persons employed on research and development* work should be classified into three groups:
   - (a) *Qualified scientists and engineers.* This group should include university graduates, holders of the Diploma in Technology, associates of certain educational institutions, and graduate and corporate members of certain professional bodies. For your convenience and purely as a guide for the purpose of this enquiry, a list of the qualifications to be covered is given below.
     - (i) Associateship of any of the following bodies:

       The Camborne School of Mines
       The City and Guilds of London Institute
       The Cranfield College of Aeronautics (Diploma)
       The Heriot-Watt College
       The Manchester College of Science and Technology
       The Robert Gordon Technical College, Aberdeen
       The Royal College of Science (London)
       The Royal College of Science (Ireland)
       The Royal College of Science and Technology, Glasgow
       The Royal School of Mines

(ii) Corporate or Graduate membership of any of the following bodies:

The Royal Aeronautical Society
The Institution of Chemical Engineers
The Royal Institute of Chemistry
The Institution of Civil Engineers
The Institution of Electrical Engineers
The Institution of Gas Engineers
The Institute of Marine Engineers
The Institution of Mechanical Engineers
The Institution of Metallurgists
The Institution of Mining Engineers
The Institution of Mining and Metallurgy
The Institution of Municipal Engineers
The Institution of Naval Architects
The Institute of Physics
The Institution of Production Engineers
The Institution of Structural Engineers

(b) Holders of only a Higher National Diploma (H.N.D.) or an engineering diploma of a recognised technical college awarded after a course of *full-time* study or a Higher National Certificate (H.N.C.)

(c) *Other workers* directly employed on research and development activities. Where workers are employed part-time, please estimate equivalent number of full-time workers. Please do not include indirect labour, e.g. cleaners, clerical staff, canteen workers.

6. Please state total expenditure on the activities listed in Note 4. If separate accounts are not kept, please estimate to the best of your ability.

7. If separate accounts are not kept, please apportion appropriate overheads giving, if preferred, a total figure for items (d) to (h) inclusive.

8. Please include amounts written off for income tax purposes. Where assessments have not been agreed, please estimate to the best of your ability.

9. The value shown should be expenditure incurred on new building work which was charged to capital account during the year, whether the buildings were in use before the end of the year or not. Please include:

(i) the cost of building and other constructional work for use in connection with research and development activities as defined in Note 4.

(ii) the cost of site preparation;

(iii) the cost of the extension or reconstruction of old buildings;

(iv) the cost of work of a capital nature carried out by your own labour force;

(v) the cost of buildings purchased.

The amount of any legal charges, stamp duties, agents' commissions, etc. incurred in acquisition of premises for research and development should also be included.

10. Please include any payments you have made to institutions, not included under (a), (b) and (c), for research and development work in connection with your production programme. Please do not include philanthropic contributions to research not related to your production, e.g. medical research if you are not engaged in pharmaceutical production.

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